

reading perfection is not aimed at; in one case (p. 68) several errors occur in a few lines.

The chapter on adjustment to light deals with light stimuli, the measurement of light, and the process of photosynthesis. Under "Adjustment to Temperature" the relation of plants to temperature is included along with digestion, respiration, germination, nutrition of hysterozytes, growth, reproduction, and propagation. The connection of all these with temperature is not very obvious, as they are the outcome of many factors. In an ecological text-book one might well expect a more recent treatment of propagation, a subject of prime importance, and one to which Danish and Swiss workers have given much attention. The chapters on adaptation to water and to light include all structural changes, and they proceed on conventional lines: decrease of water-loss through leaf position, rolling of the leaf, changes of epidermal cells, stomata, &c.; types produced by adaptation to water, xerophytes, &c.; the relation of organs to light, types of leaves as determined by light, and other topics. "The Origin of New Forms" (chapter ix.) includes a short history of evolution, and sketches rapidly origin by adaptation, variation, and other processes.

The latter part of the book (chapters x.-xv.) shows Prof. Clements at his best. His views as given in "Research Methods" have already had great influence; these form the basis of the chapters in the present work, but the new arrangement is a great improvement on the old. The study of vegetation by quadrats and transects is now a recognised method of the ecologist, and the chapter on it forms a good introduction for the advanced student. The plant formation (chapter xi.) is defined as "an area of vegetation, such as a meadow, a forest, a prairie, a bog, a cliff covered with lichens, or a pond of water-lilies." The cautions given under "recognition of formations" are timely, because "the unit itself shows parts which may be mistaken for formations"—a very common error. The formation depends on habitat, and is a product of it, but the author wisely points out the existence of a historical factor "due to the accidents of migration and competition, or to the fact that the plant itself has a certain ancestral or historical quality that enables it to persist." No student of ecology can omit to read carefully the description of the formation, or what one naturally calls the "Clements formation"; it matters little whether it is synonymous with the conceptions of other authors, but it is an introduction to the varying phases of vegetation which in its definiteness and detail has few rivals. The chapters discussing aggregation and migration (xii.), competition and ecesis, or the adjustment of a plant to a new habitat (xiii.), invasion and succession (xiv.), and alternation and zonation (xv.) are all important; they deal with features one constantly meets in the field, and these chapters will assist much in giving that mental perspective so greatly needed in Britain, where the units of vegetation are limited in extent and liable to disturbance.

The irritating nomenclature of "Research

Methods" does not appear in this book; such terms as are retained are few, and so useful that they have already been adopted. The illustrations, where they refer to ecology, are helpful and are well reproduced. The provision of an index is an improvement on the author's former book, but we think the omission of references to literature is not justifiable in this period of ecology and in a book which is obviously only feeling its way. The publication of this book will have a marked influence on teaching, and it is well that one backed by so much experience should lead the way. The enthusiasm of the author can be traced through every page; ecology is always in his mind, and he weaves it into botanical teaching from the commencement. The course leads in the right direction, although slight differences of opinion on detail may be inevitable.

W. G. S.

MARINE METABOLISM.

Conditions of Life in the Sea. A Short Account of Quantitative Marine Biological Research. By J. Johnstone. Pp. xiv+332. (Cambridge: University Press, 1908.) Price 9s. net.

SINCE Hensen published, in 1887, the first account of his methods for the quantitative estimation of the plankton, an ever-increasing number of workers has entered the field of marine biological research. To quote from the author in the preface:—"It is characteristic of a really great idea in science that it should stimulate further discovery by the suggestion of new lines of research and new methods of investigation." Already many results of the greatest interest have been obtained, and the lines on which modern research is being carried out are rich in promise. The absence of any adequate summary of these researches has been a serious gap in scientific literature, for on account of the diversity and inaccessibility of a great number of the memoirs, this subject still remains a *terra incognita* to the great majority of readers. To meet this demand in a satisfactory manner the range of the subjects that would have to be entered into is very considerable; and Mr. Johnstone is to be congratulated on the masterful manner in which he has carried out this task in writing "Conditions of Life in the Sea." A clear and concise account of all the more important work is given in language devoid of unnecessary technicalities, and in dealing with the more speculative problems the author states *pro* and *con*. with an impartiality which is quite refreshing.

Part i. is an introduction to the problems discussed later on in the work, and is primarily intended for the benefit of those who have no special knowledge of oceanography. A short account is given of the gear and methods of the marine biologist. Facts relating to the geology and to the hydrographical and physical conditions of the north-western ocean are summarised. The reader is made familiar with the commoner and more widely distributed marine fauna and flora, special reference being made to the plankton. Finally, the economic and biological importance of the fishing industries is briefly outlined.

Part ii. deals with the methods and results of quantitative biological research. The author discusses fully the classical experiments of Hensen and Lohmann on the quantitative estimation of the plankton, giving the defects and limitations of these methods without bias. The last two chapters in this section are headed "A Census of the Sea" and "The Productivity of the Sea"; in them an attempt is made to view questions of economic value from a quantitative biological standpoint. That the estimation of the number of marketable marine fishes on a given fishing area, or calculations as to its yield per acre per annum, must as yet be purely speculative is fully appreciated. This, however, does not detract from the great value of these deductions, the interest in figures such as these lying more in the possibilities they suggest than in their mathematical correctness. The system of "trial and error" enters so largely into scientific investigation that perfection cannot be hoped to be attained without the aid of some such provisional results.

Part iii., under the title "Metabolism in the Sea," is, perhaps, the main feature of the book. The researches of Pütter on the nutrition of marine organisms, and those of Brandt on the "Law of the Minimum," are treated at length. A chapter is devoted to marine bacteria, and emphasis is laid on the possibility that nitrogen is the determining factor in the sea, and the denitrifying bacteria the cause of the observed scarcity of nitrates and nitrites in tropical and subtropical waters. The extraordinary abundance of planktonic life in the Arctic seas has given rise to much discussion, but in our present state of knowledge this phenomenon can be best explained by the hypothesis that, owing to the inhibition of bacterial activity at low temperatures, there is no diminution from this cause in the supply of the nitrogenous food-stuffs that can be utilised by the marine protophyta. The constituents of sea-water such as nitrates, phosphates, silica, &c., are present in such minute traces that quantitative determination is extremely difficult. The author might have laid greater stress on this point, since no really satisfactory methods of analysis have yet been perfected.

References to literature, a most important point in a work of this kind, are given freely throughout the text, a bibliography of the more fundamental memoirs being also included as an appendix. Authors and subjects are indexed separately, so that references can be most easily found.

Besides a few obvious misprints we note the following:—P. 67, line 2, oviparous for viviparous in reference to *Acanthias*, the spur-dog; p. 96 (in the diagram), *Aurelia*, *Rhizosolenia*, should read *Aurelia*, *Rhizostoma*; and p. 193, line 1, agriculture for aquiculture.

The illustrations are mostly quite diagrammatic, and as such serve their purpose, but in some cases (pp. 68, 79) clearness is sacrificed by representing plankton animals lying across one another. The printing, binding, &c., are uniform with the well-known "Cambridge Biological Series," to which this work is a welcome addition.

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ANATOMY OF THE HORSE.

The Surgical Anatomy of the Horse. Part iii. By J. T. Share-Jones. Pp. x+220. (London: Williams and Norgate, 1908.) Price 15s. net.

THE third of the four volumes which are to form a "Surgical Anatomy of the Horse" deals with the hind limb, and will doubtless fulfil the author's hope that it may be "at least as acceptable as the preceding volume both to students and practitioners in the study and practice of the important branch of veterinary work to which it relates." The present volume has all the merits of its predecessors. Of its value as a means by which the practitioner may refresh his memory of the anatomy of the regions with which he is concerned surgically there can be little question. In some places the anatomical descriptions are both long and detailed, and contain all the information which is in any way important. At the same time, the present part of the work is not without some of the defects exhibited in those sections of the work which have already been noticed in these columns.

One matter which the author would be well advised to ponder, in view of the possible demand for a subsequent edition, is that of having all the figures drawn from either the right or the left limb. It does not make for ease of comprehension to find that neighbouring plates illustrate the one the right the other the left limb. Comparison would be a much simpler matter if all the figures represented the same side of the body. It is bad enough when different plates do not correspond, but it is exasperating when the same plate contains figures some of the right and some of the left limb. In Plate xviii., Fig. A shows the superficial markings of the *left* hock, Fig. B illustrates the arrangement of the ligaments from the same aspect of the *right* hock, and Fig. C depicts the disposition of the bones on the medial side of the *left* hock. It may be remarked in passing that Figs. B and C of Plate xx. are not of the *left* hock. Plates xxiv. and xxv. both illustrate the seat of anterior tibial neurectomy, but one figure is drawn from the left limb, the other from the right.

While recognising the enormous importance of the tarsus as a surgical region, we are not prepared to admit that it is necessary to have seven figures to illustrate the position of the various bones, nor are we prepared to allow that the grooves and ridges on the medial side of the tarsus are of such surpassing significance as to merit so much attention. Their importance from the clinical aspect is open to question, and, from the anatomical side, it is clearly recognised that the degree of their variation is great.

Mr. Share-Jones again makes use of a nomenclature in the defence of which there is little to be said. So long, however, as his readers understand what is meant, exception can be taken to the terms employed on academic grounds only. At the same time, it seems a pity that adjectives like "external lateral" and "internal lateral" should not be omitted, if only on the grounds of the desirability of brevity.

To apply the term "sciatic" to the internal